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(71) Applicant : **IMI Cornelius Inc.**
One Cornelius Place, Highway 10 West
Anoka, Minnesota 55303 (US)

(72) Inventor : **Goulet, Douglas**
One Cornelius Place, Highway 10 West
Anoka, Minnesota 55303 (US)

(74) Representative : **Parnham, Kevin**
IMI plc, Patents & Licensing Department, P.O Box 216, Witton
Birmingham B6 7BA (GB)

(54) Carbonator.

(57) A narrow profile carbonator is shown, consisting of a pair of cold drawn sheet metal halves 12, 14. Each half 12, 14 defines corresponding alternating seams and ridges and are welded together around a perimeter there of and along each corresponding seam. When both halves 12, 14 are welded together the ridges define an interior plurality of vertical interior columns, which columns are fluidly interconnected with top and bottom interior channels. The top channel includes a pressure relief valve, a carbon dioxide inlet fitting, a water inlet fitting, and a level sensor fitting for retaining a level sensor. A plurality of carbonated water lines extend from the bottom of the carbonator and up along and closely adjacent a side of the carbonator. The carbonated water lines terminate at a point above the carbonator and provide for direct securing to a beverage dispensing valve. The carbonator is preferably of the integral type and held within the water tank of an ice bank type dispenser or within the ice bin of a cold plate cooled dispenser.

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The present invention relates generally to carbonators for use with beverage dispensing equipment, and more particularly but not exclusively, to integral carbonators submerged in an cold water bath or ice bin of such beverage dispensers.

Carbonators are well known in the art and provide for combining water and carbon dioxide for the production of carbonated water. Such carbonators are typically used in beverage dispensing devices. The carbonated water they produce is combined in a post-mix beverage dispensing valve with a syrup to produce a carbonated beverage. Beverage dispensing machines generally provide for cooling of the liquid drink constituents through the use of a cold plate cooled by a volume of ice, or mechanically by a refrigeration system including an evaporator submerged in a water bath around which evaporator a bank of ice is formed. Heretofore, it has been known to submerge the carbonator either in the liquid water bath of a ice bank type machine or placed the carbonator in the ice bin of a cold plate device. A draw back with the use of the carbonator within an ice bin or cold water bath concerns the volume of such interior space devoted to the carbonator. Since carbonators are pressurized to provide for the carbonating of the water, they are typically a cylindrical pressure vessel. As a result thereof, the carbonator can significantly detract from the size of the ice bank or the volume of ice held in the particular beverage dispenser.

A further problem in beverage dispensing, indirectly related to carbonators, concerns what is referred to in the industry as "a casually drawn" drink. If a beverage valve is not used for a period of time to dispense a drink, the carbonated water existing in the line connecting the valve to the carbonator can become warmed. Thus, the first drink drawn from such a valve after a lapse of time can be unacceptably warm due to the heating of the carbonated water.

It would be desirable to have a beverage dispensing device that provides for a carbonating strategy that reduces the effect of such warming and provides for acceptably cool casually drawn drinks.

In accordance with the present invention there is provided a carbonator, comprising: a tank having a first side a second side spaced from the first side and a perimeter edge extending around and joining the first side to the second side, and the perimeter edge defining a tank top end a tank bottom end and tank side ends and the side ends extending between the top and bottom ends and the edge defining a width of the tank wherein the width is a substantially smaller dimensional length than a length of the top end bottom end or side ends so that the tank is substantially narrow in its width dimension relative to the top, bottom or side end lengths, a plurality of points within the tank perimater edge at which the first side is secured to the second side for defining a plurality of tank internal volume areas, and the volume areas in fluid communication with each other, and the tank having a gas fitting on the top end thereof for connecting to a source of carbon dioxide gas and one or more carbonated water lines extending from the bottom end thereof, and a water inlet fitting secured to the tank for providing connection to a source of water.

Preferably, the carbonator is held in either an evaporator cooled ice bath or a ice bin of a beverage dispenser system. The carbonator water lines being coupled to beverage dispense lines.

Embodiments of the present invention will now be described by way of example only with reference to the following figures, wherein:

Fig. 1 shows a perspective view of the present invention.

Fig. 2 shows a top plan view along lines 2-2 of figure 1.

Fig. 3 shows a partial cross-sectional side plan view along lines 3-3 of figure 2.

Fig. 4 shows an end plan view along lines 4-4 of Fig. 3.

Fig. 5 shows a cross-sectional view of the present invention along lines 5-5 of Fig. 3.

Fig. 6 shows a side plan partial cross-sectional view of an ice bank cooled beverage dispenser with the carbonator of the present invention contained therein.

Fig. 7 shows a side plan partial cross-sectional view of an ice cooled cold plate type beverage dispenser with the carbonator of the present invention therein.

Fig. 8 shows a perspective view of a further embodiment of the carbonator of the present invention.

Fig. 9 shows a cross-sectional view along lines 9-9 of Fig. 8.

Fig. 10 shows a side plan partial cross-sectional view of a drop-in type ice cooled cold plate beverage dispenser with the carbonator embodiment of Fig. 8 retained within a vertical portion of an L-shaped cold plate.

A carbonator of the present invention is seen in figures 1-5 and generally is referred to by the numberal 10. As seen therein, the carbonator 10 includes a first half 12 and a second half 14. Halves 12 and 14 are made from a suitable sheet metal such as 18 gauge stainless steel. In particular, they are cold drawn to form an alternating pattern of seams 16 and ridges 18. Halves 12 and 14 are welded together around their respective perimater edges having top and bottom perimater edge portions 20 and 21 respectively and side edge portions 22 and, along corresponding seams 16 to form the carbonator tank 22. It can be seen that tank 22 includes a top tank volume area 24, a bottom area 26 and a plurality of vertical column areas 28. The top and bottom areas 24 and 26 provide for fluid communication between the columns 28. A top end 29 of tank 22 includes a pressure relief

valve 30, a carbon dioxide inlet fitting 32, a water inlet fitting 34 and a level sensor fitting 36 for retaining a level sensor 38. Sensor 38 includes a higher level sensing contact 38a, and a low level sensing contact 38b that are connected by a pair of wires 40 to an appropriate control means. A J-tube 41 is secured to fitting 34 and extends within a column 28.

A plurality of carbonated water lines 42 extend from a bottom end 43 of tank 22 and include vertical portions 42a that travel upwardly closely along and adjacent first half 12 and then extend with horizontal portions 42b over end 29 and outwardly therefrom in a direction towards side 14 and terminate with beverage valve fittings 44.

As is seen by referring to figure 6, carbonator 10 of the present invention is shown in an ice bank type of beverage dispenser 50. As is known in the art, dispenser 50 includes an insulated water bath tank 52 having a plurality of evaporator coils 54 therein for producing an ice bank 56 thereon. Refrigeration means, not shown, are attached to coils 54 to provide for cooling thereof. Carbonator 10 is located within tank 50 and adjacent a front end 58 of dispenser 50. In particular, dispenser 50 includes a plurality of beverage dispensing valves 60 secured to the front end 58. It can be understood that carbonated fittings 44 allow lines 42 to be hard-plumbed directly to each valve 60. It can be understood that carbonator 10 can be of various dimensions to fit the particular dispenser and to provide for the desired volume or capacity. In one embodiment of the present invention, carbonator 10 is substantially rectangular having a tank length, between side edges 22, of approx, 16 inches, and each column 28 has a height, between edges 20 and 21 of approx. 10.5 inches and a diameter, between corresponding ridges of halves 12 and 14, of approx. 1.25 inches, providing for an overall tank interior volume of approx. 65 ounces. It can be appreciated that the multiple seams 16 provide for the structural strength necessary to make a container that is relatively flat, that is, has a width that is proportionately less than the height or length thereof, and able to safely withstand the operating pressures of typically 100 pounds per square inch. Thus, carbonator 10 is designed to spread its volume over a larger surface area than standard cylindrical carbonators, but to do so in a manner that it can be efficiently packaged into a water bath with the minimum impact on the useable interior volume thereof. Moreover, it can be appreciated that the relatively large surface area of carbonator 10 provides for efficient and rapid cooling of the carbonated water contents thereof, and such surface area is enhanced by the washboard surface created by ridges 18 and seams 16. Dispenser 50 also includes a removable plate 62 that provides access to a space 64 between plate 62 and tank 52. A water delivery line 66 connected to a source of potable water and a water pump, not shown, is routed through space 64 and, as is known in the art, delivers water to a water coil, not shown, retained within tank 52. The water coil, in turn is connected to water inlet 34 so that carbonator 10 receives a supply of pre-cooled water. A carbon dioxide gas delivery line 68 is routed through space 64 and is connected to gas inlet 32.

In operation, carbonator 10 is connected to a source of pressurized carbon dioxide gas by line 68 and water enters tank 22 through J-tube 41 and fills tank 22 until sensor 38a is in contact with the water indicating a full level at which point the control means stops the operating of the water pump. Thus, as in conventional carbonators, water is mixed with carbon dioxide gas under pressure thereby forming carbonated water. As is known, when both contacts 38a and 38b are not in contact with water the control means signals for the water pump to operate and fill tank 22 with additional water until contact 38a is again immersed in water. It can be appreciated that the majority of the length of lines 42 are cooled directly by immersion in the cooled water of bath 52, and the remainder thereof exists in an area generally cooler than the surrounding ambient conditions. Thus, providing the water bath is sufficiently cool, there will always be a good reserve of cool carbonated water, and the problem of carbonated water warming associated with a casually drawn drink is greatly minimized.

As seen in figure 7, a beverage dispenser 70 of the cold plate type is shown. In such a dispenser 70 a cold plate 71 is typically located at the bottom of an ice containing bin 72. An example of an ice bin and the securing thereof to a cold plate as seen in U.S. Patent No. 4,958,505, the contents of which patent is incorporated herein by reference thereto. In particular plate 71 includes an upturned edge 71a to which a liner 73 is secured thereby creating in conjection with plate 71 the ice retaining area or bin 72. Carbonator 10 can be located within bin 72 and in contact with ice 74, and lines 42, as with dispenser 50 above, directly secured to beverage dispensing valves 60. Thus, carbonator 10 also efficiently distributes its volume in an ice bin as well and, providing there is sufficient ice therein, also greatly minimizes the effects of carbonated water warming resulting from a casually drawn drink. Dispenser 70 also includes access cover 62 and a space 64. A carbon dioxide gas line 75 extends through space 64 for securing to gas inlet 32. As is known in the art, plate 71 includes a plurality of serpentine coils (not shown) for containing the various beverage constituents such as syrup and water for pre-cooling thereof prior to delivery to the valves 60. In dispenser 70, plate 71 includes a coil line 76 for pre-cooling flat water prior to delivery to carbonator 10. Line 76, after flowing through plate 71, can extend out of plate 70 and through bin 72 for connecting to inlet 34. As seen referring to Fig.'s 8 and 9, a further embodiment of the carbonator of the present invention is seen. In this embodiment carbonator 80 has halves

80a and 80b secured around a perimeter edge 82. However, unlike carbonator 10 halves 80a and 80b are not convoluted in any manner, rather they are flat. Furthermore, halves 80a and 80b are not secured together at any point or points interior of edge 82. Thus, carbonator 80 has one unobstructed interior volume space 84. Carbonator 80 includes a plurality of carbonated water lines 86. Lines 86 extend externally from top end 88 and extend internally into volume 84 terminating closely adjacent a bottom end 90. The carbonator 80 can also optionally have an extended perimeter webbing 92 around the sides and bottom there of. Webbing 92 can be used wherein the carbonator 80 forms a fourth side of a ice-bin liner. Thus, as per the ice cooled unit of Fig. 7, webbing 92 would fit into edge 71a along the bottom thereof and an alternate liner 94, seen in Fig. 9 would be secured to the remainder of edge 71a and to webbing 92 along flange ends 94a thereof. The operation of carbonator 80 is the same as that for carbonator 10 except that the carbonated water is delivered by lines 86 from the top of carbonator 80. It can be appreciated by those of skill that carbonated water lines 86 could also be used in place of lines 42 in carbonator 10. An embodiment of the present invention using lines 42 will have a little more flexibility in the connecting of such lines to the valves 60 as line 42 can be moved or bent more easily than lines 86 which are shorter and more rigid. Also, an embodiment of the present invention using the strategy of lines 42 is somewhat less complicated structurally on the top end thereof. It can be appreciated that carbonator 80 will have to be made of a thicker gauge material than carbonator 10 to withstand the same internal pressure, even in low pressure applications of 30-60 pounds per square inch useful for certain low carbonated drinks and the like. Another strategy for pressure containment is seen by referring to Fig. 9. Which shows a drop-in type beverage dispenser 100, known in the art, that is typically ice-cooled, and "dropped into" a countertop 102. Dispenser 100 includes an L-shaped cold plate 104 of the type seen in co-pending application Serial No. 07/960,806, which application is incorporated herein by reference thereto. Cold plate 104 is held within a ice retaining bin 105 which defines an ice retaining space 105a for retaining ice 106 therein, and includes a horizontal portion 104a and a vertical portion 104b. Carbonator 80 is shown cast into vertical portion 104b. Thus, the cast metal, typically aluminum, when hardened, services to provide an external means of strengthening carbonator 80 against failure as the result of high internal pressures. Lines 86 can then run directly and internally through a tower 107 for direct connection to beverage valves 108. In addition, the portion of lines 86 external of plate portion 104b can be insulated with a suitable insulation material 110. As is known, plate 104a includes serpentine coils of tubing for cooling beverage constituents. A coil line 112 is connected to a source of potable water and a water pump, (not shown) and first extends through plate 104a and then upwardly through plate portion 104b for ultimate connection to water inlet 34. A carbon dioxide gas line, (not shown), is routed through in 105 and space 105a for connection to inlet 32 of carbonator 80. In operation, the carbonator 80 of dispenser 100 is cooled by heat exchange with ice contained within bin 105 and thereby efficiently and rapidly cools the carbonated water therein. Also, as the lines 86 are cooled by heat exchange with portion 104b and are themselves insulated, unwanted heating as the result of infrequent drink dispensing is greatly reduced.

It can be appreciated that carbonator 10 and 80 could be interchanged in the various applications shown herein, and the lines 42 and 86 could be interchanged. Furthermore, it can be understood that carbonators 10 and 80 eliminate the need for a carbonated water manifold structure typically found adjacent the dispensing valves of a beverage dispenser. Such a manifold structure receives carbonated water from one line and then has a plurality of outlets for delivering the carbonated water individually to each valve. Since carbonators 10 or 80 provide such individual delivery lines such a manifold structure is not needed. It can also be appreciated by those of skill in the art that various modifications can be made to the present invention without exceeding the scope and inventive concept thereof. For example, the number of alternating seams and ridges or the orientation and pattern thereof can be varied. Thus, seams 16 and their associated welds need not be along straight lines or lines at all, for the matter, the internal joining of halves 12 and 14 could be accomplished by any plurality of individual points or other welding patterns that sufficiently secure them together to provide for a tank that can safely withstand the intended operating pressures. In addition, carbonators made in accordance with the present invention need not be rectangular as depicted but could be of various shapes as defined by the perimeter thereof, provided the overall length and height is substantially greater than the width thereof so that the carbonator is relatively flat or narrow in its width dimension in proportion to its length and height. Also, it can be appreciated that carbonators 10 or 80 can be located in different positions and orientations within a water bath or ice bin of a beverage dispensing device, and, or course, can be used externally of a beverage dispensing device. For example, carbonator 80 could be oriented substantially horizontally at a shallow angle at the bottom of dispenser bin 72 above or below plate 71. The shallow angle would provide for a space at "top" end 29 so that a pressure head gas space could be maintained. Of course, any level sensor used therein may have to be modified to account for the changed high and low water sensing operation that would be occasioned by such a substantially hor-

izontal orientation.

Claims

1. A carbonator, comprising:
a tank 22 having a first side 12, a second side 14 spaced from the first side and a perimeter edge extending around and joining the first side to the second side, and the perimeter edge defining a tank top end 24, a tank bottom end 26 and tank side ends 22, and the side ends 22 extending between the top 24 and bottom ends 26, and the edge defining a width of the tank wherein the width is a substantially smaller dimensional length than a length of the top end 24, bottom end 26 or side ends 22 so that the tank is substantially narrow in its width dimension relative to the top, bottom or side end lengths, a plurality of points within the tank perimeter edge at which the first side is secured to the second side for defining a plurality of tank internal volume areas, and the volume areas in fluid communication with each other, and the tank having a gas fitting on the top end thereof for connecting to a source of carbon dioxide gas and one or more carbonated water lines extending from the bottom end thereof, and a water inlet fitting secured to the tank for providing connection to a source of water.

2. A carbonator as claimed in claim 1 incorporated in a beverage dispenser.

3. A carbonator as claimed in claim 2 wherein the beverage dispenser includes evaporator coils to cool a water bath in which the carbonator is held and the one or more carbonated water lines are secured to corresponding beverage dispensing valves of the beverage dispenser.

4. A carbonator as claimed in claim 2 wherein the beverage dispenser includes an ice bin in which the carbonator is held and cooled by ice deposited therein, and, the one or more carbonated water lines are secured to corresponding beverage dispensing valves of the beverage dispenser.

5. A carbonator as claimed in any proceeding claim, and the one or more carbonated water lines extending from the tank and closely adjacent one of the sides thereof and terminating at a point adjacent the tank top end with valve connecting ends for providing connecting to a corresponding beverage dispensing valve.

6. The carbonator as claimed in any proceeding claim, and the first and second tank sides each having a plurality of alternating ridges and seams wherein the seams are secured together along the lengths thereof for defining the plurality of points at which the first and second sides are jointed.

7. The carbonator as claimed in claim 6, and the seams extending substantially along lines extending partially between the tank top end and tank bottom end for defining alternating tank internal column areas and a tank internal bottom area and tank internal top area.

8. The carbonator as claimed in any proceeding claim, and further including a pressure relief valve means.

9. The carbonator as claimed in any proceeding claim, and further including a water level sensing means for connecting to control means and the control means connected to water pump means, the water pump means connected to the source of water for pumping water under pressure into regulating the operation of the pump means in response to signals from the sending means for regulating the level of water within the carbonator tank,.

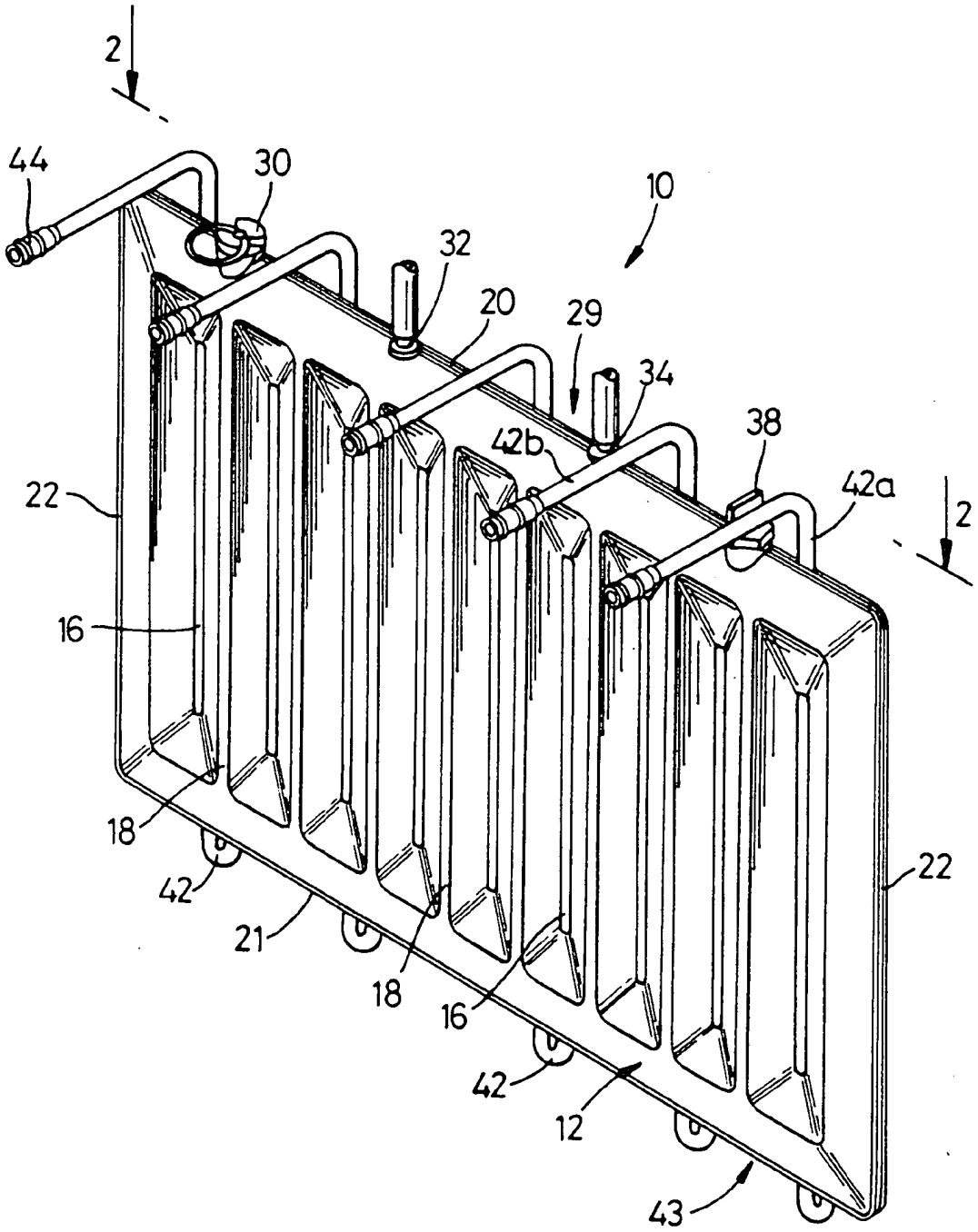

Fig. 1

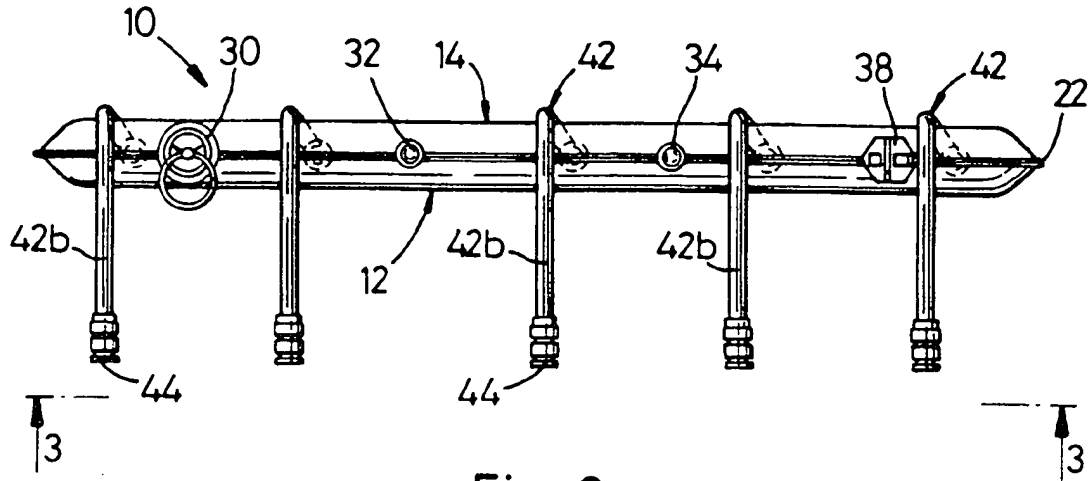

Fig. 2

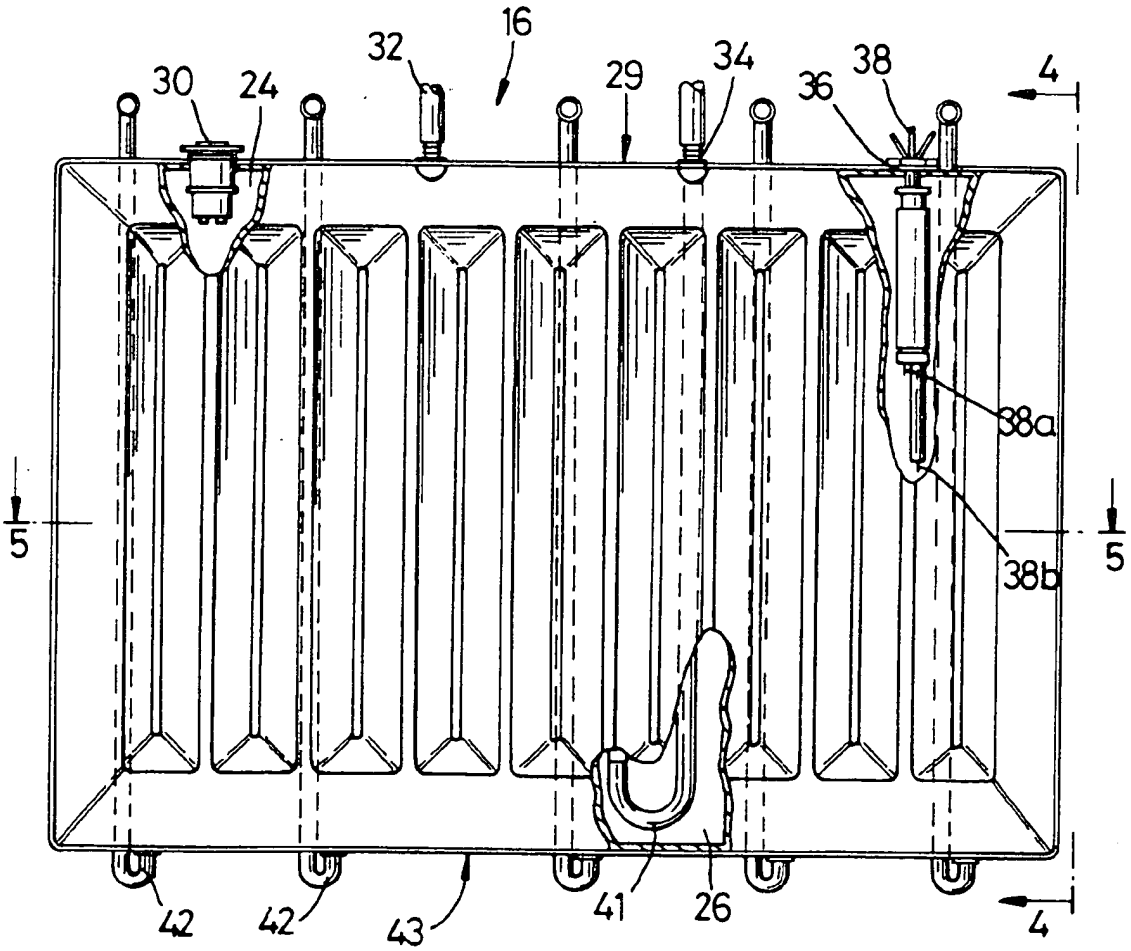

Fig. 3

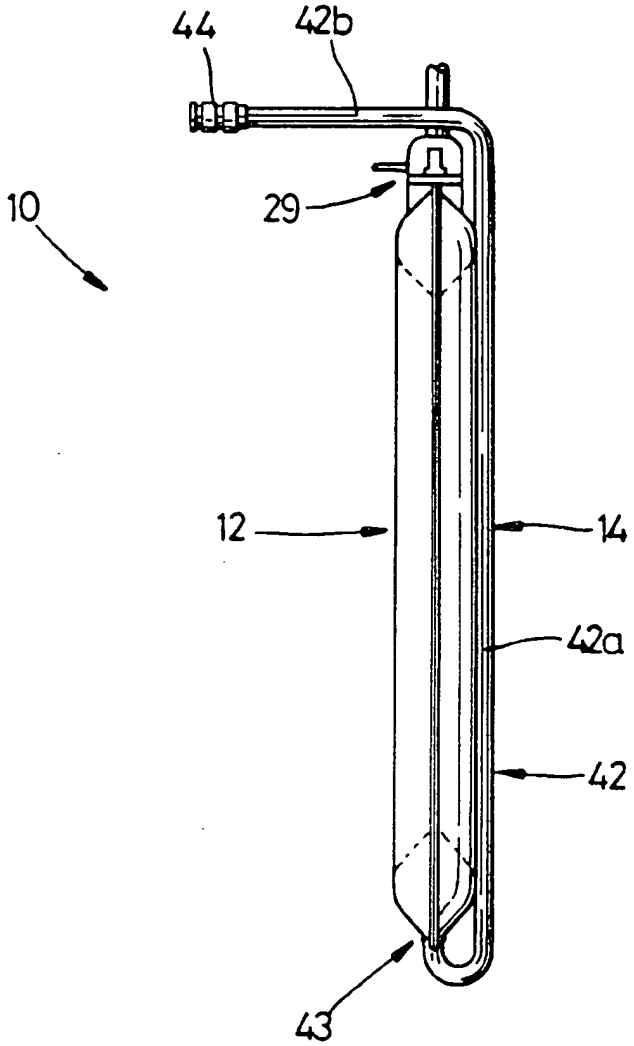

Fig. 4

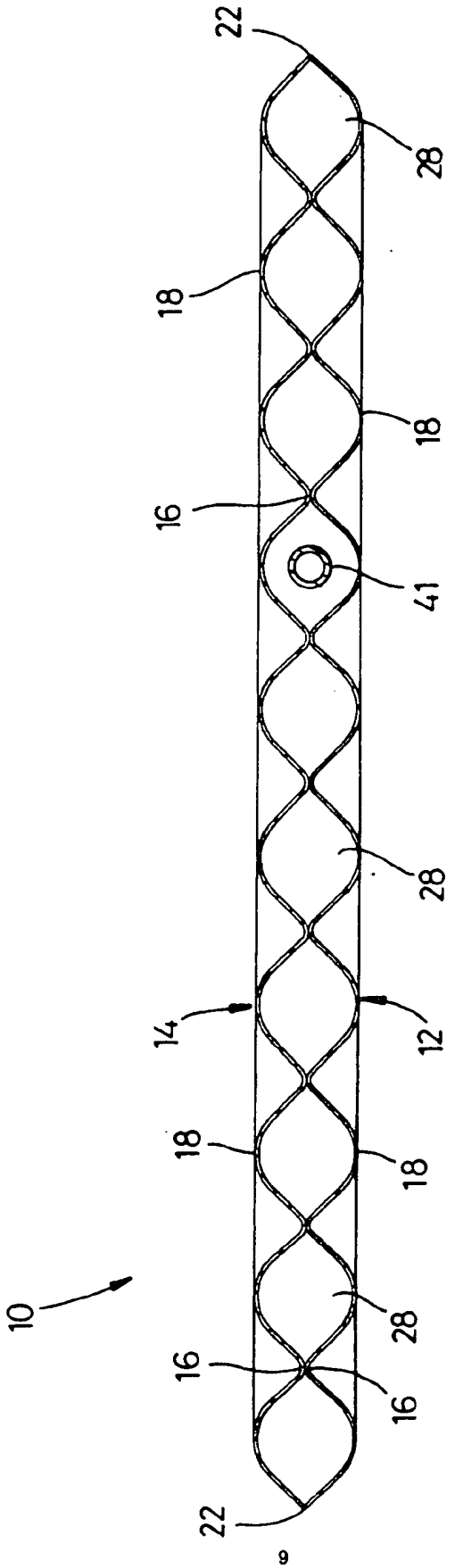

Fig. 5

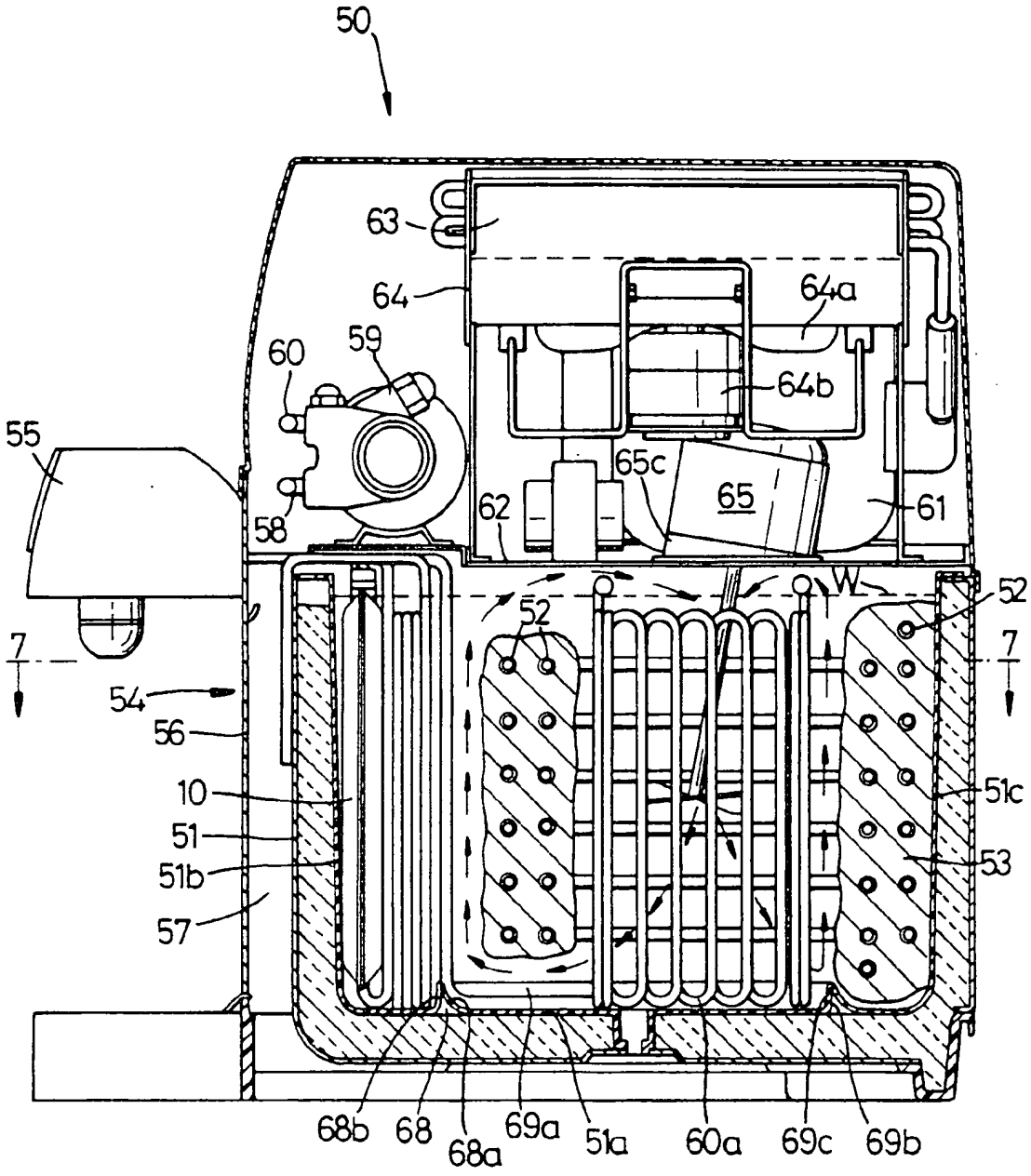

Fig. 6

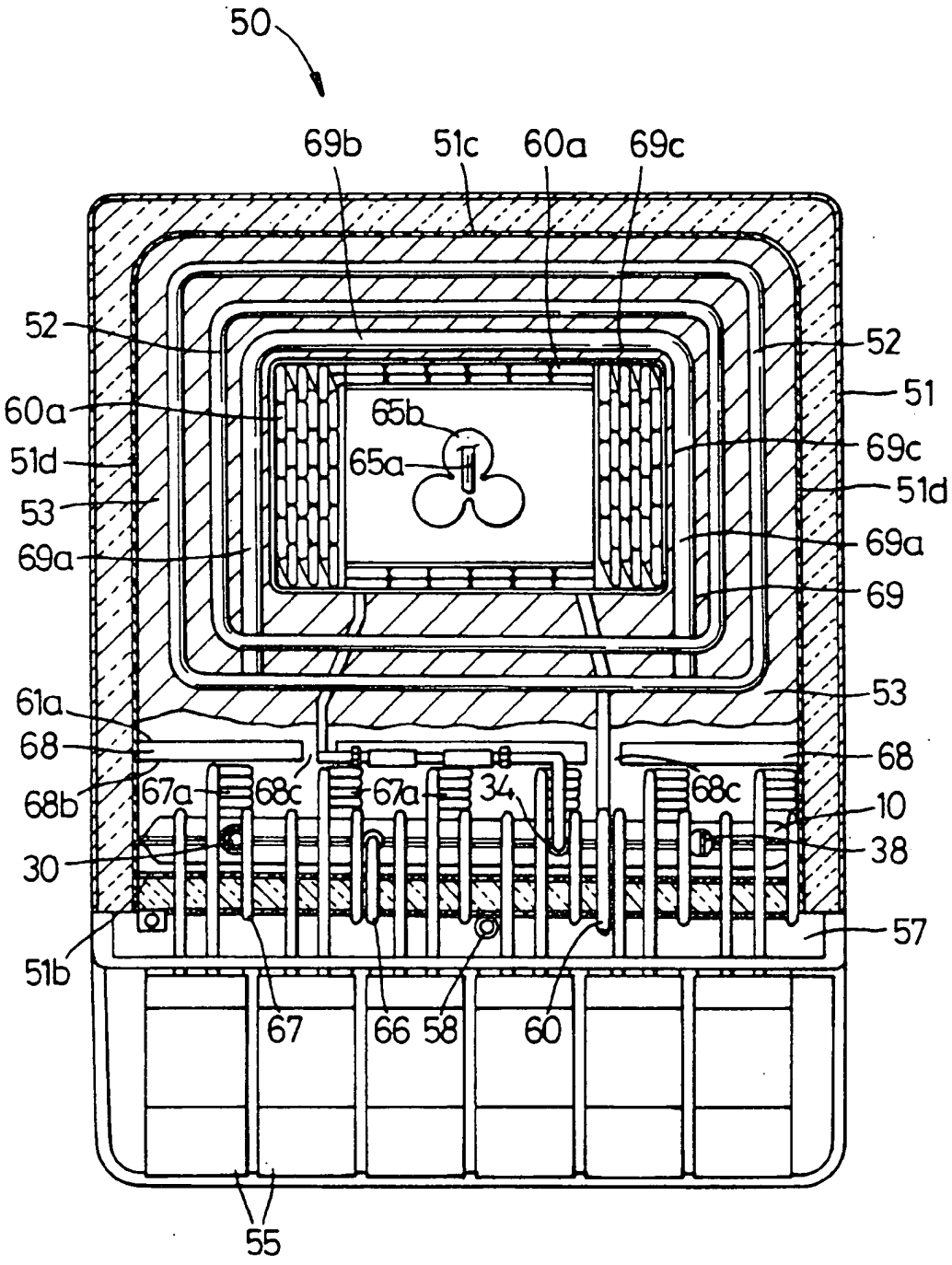

Fig. 7

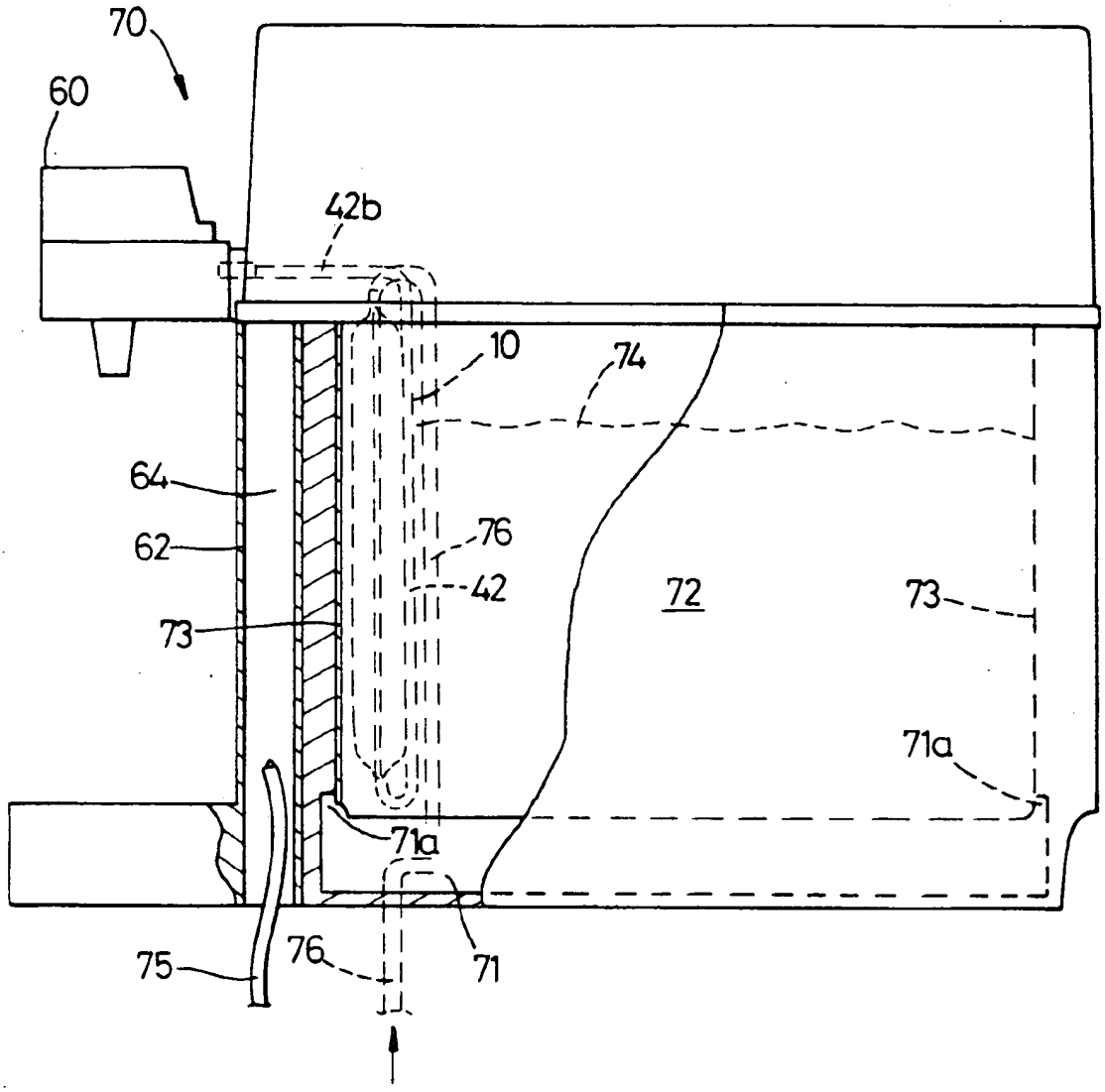

Fig. 8

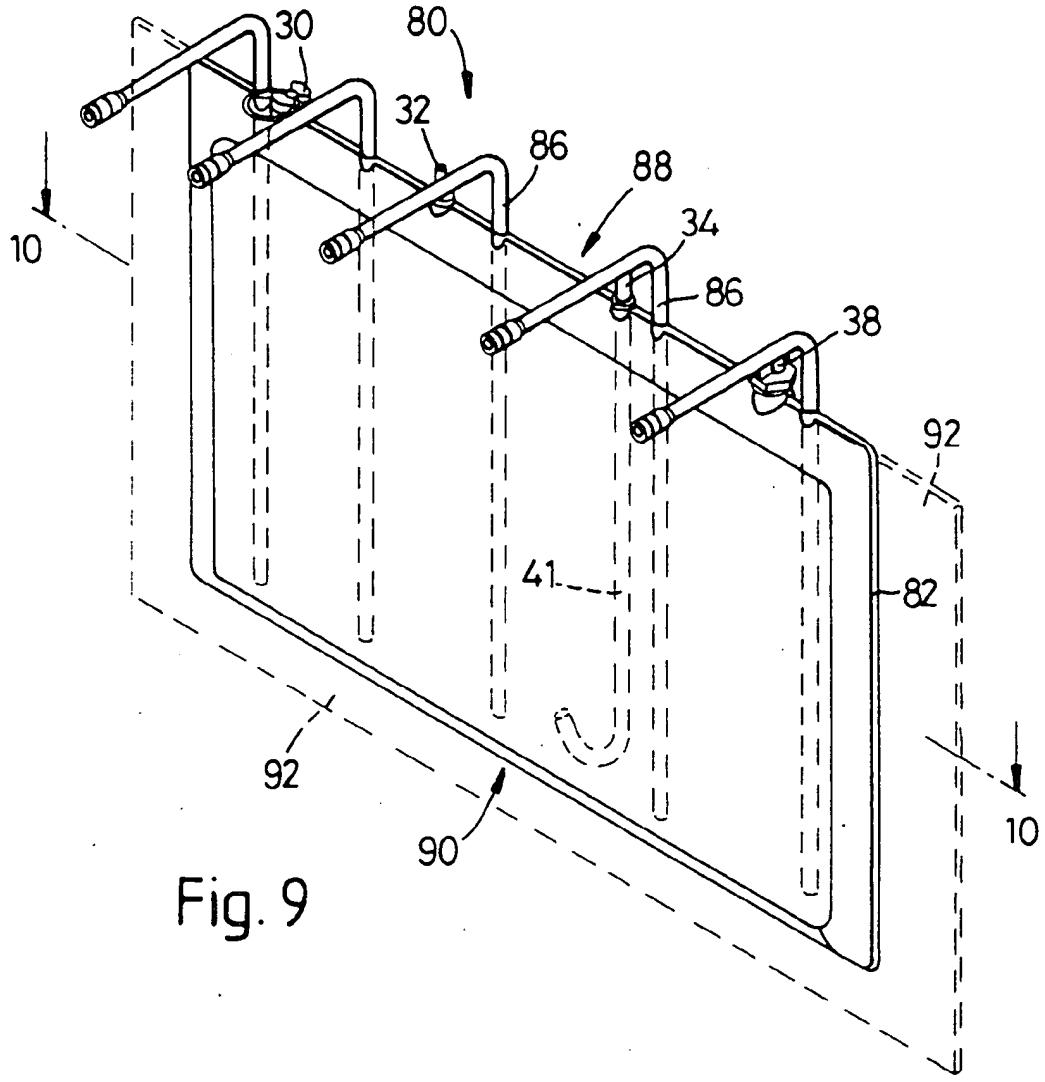

Fig. 9

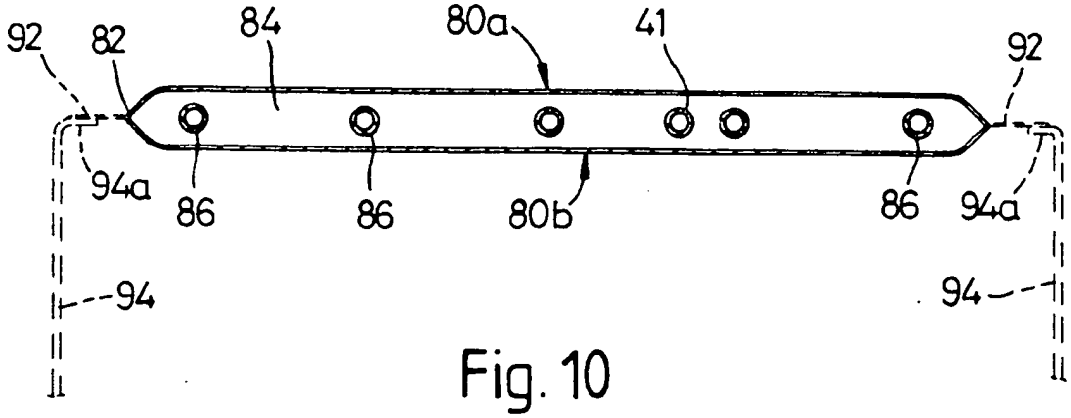

Fig. 10

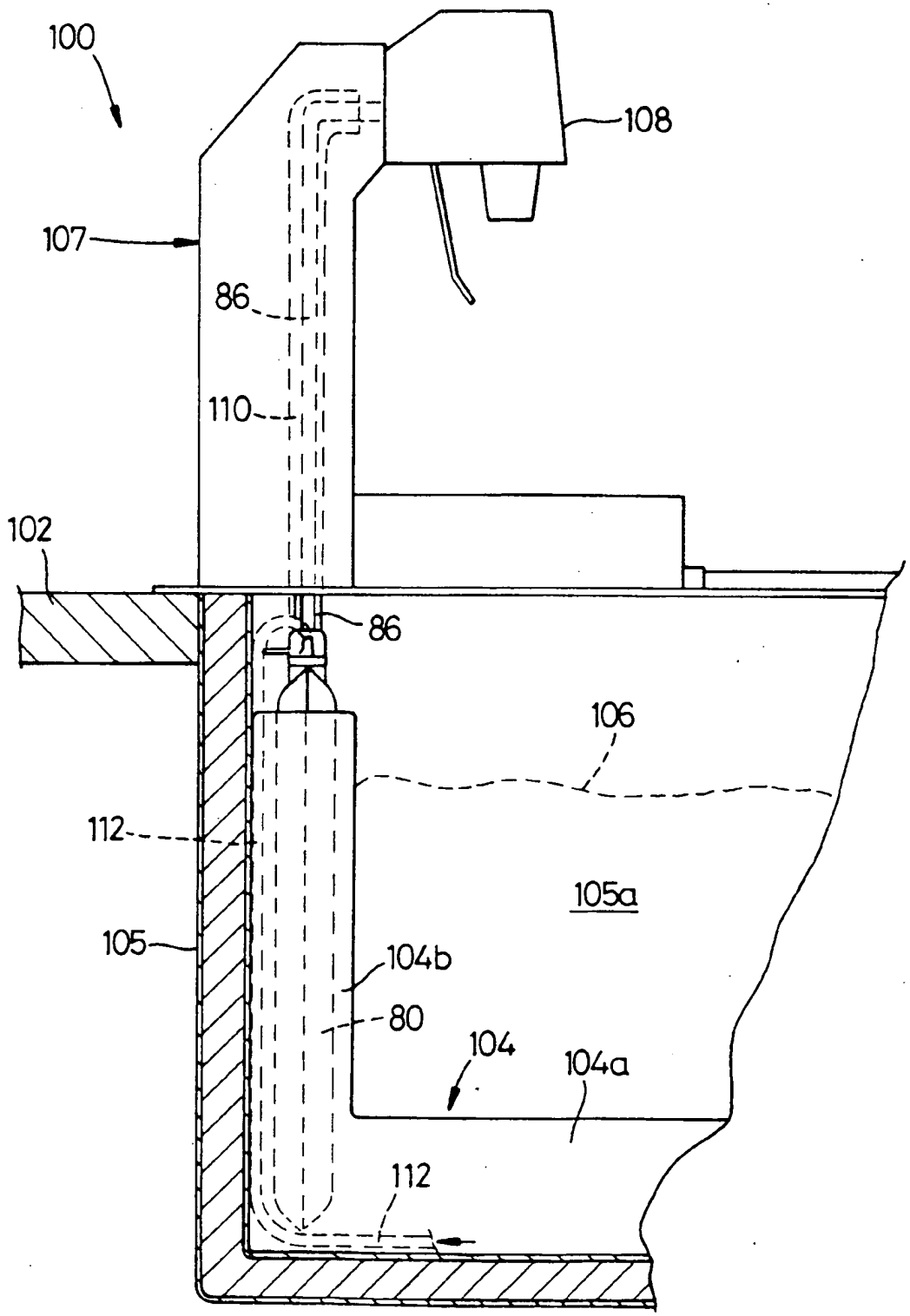

Fig. 11

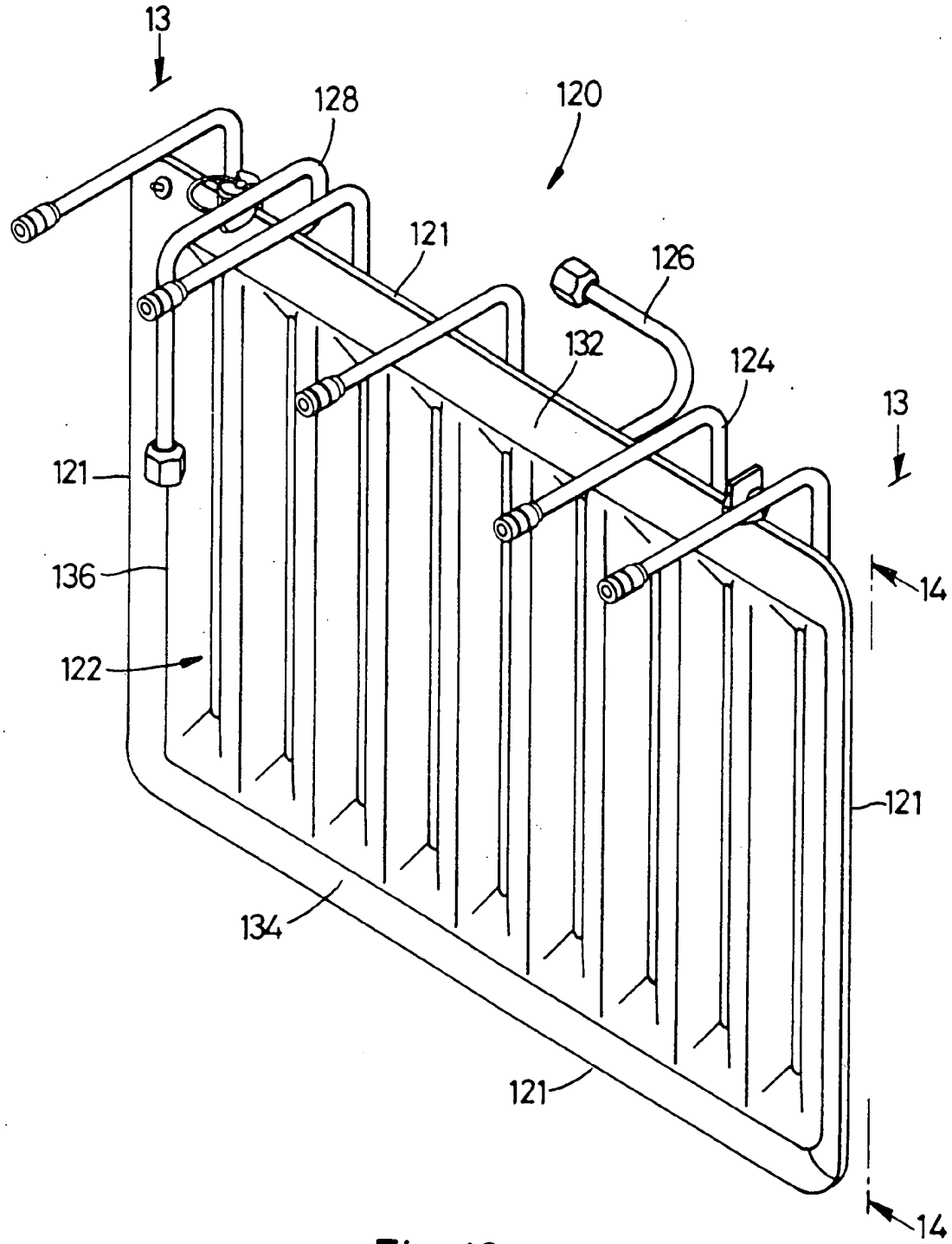

Fig. 12

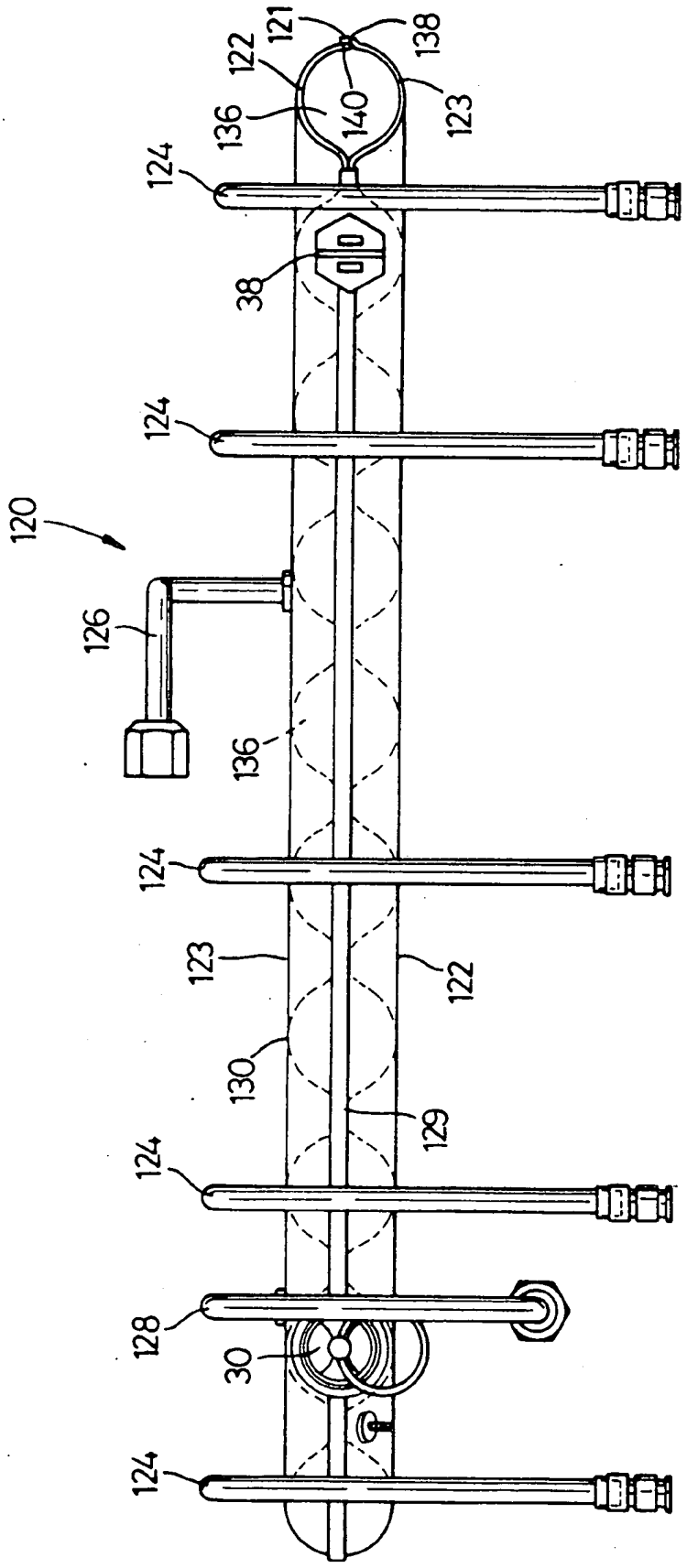

Fig.13

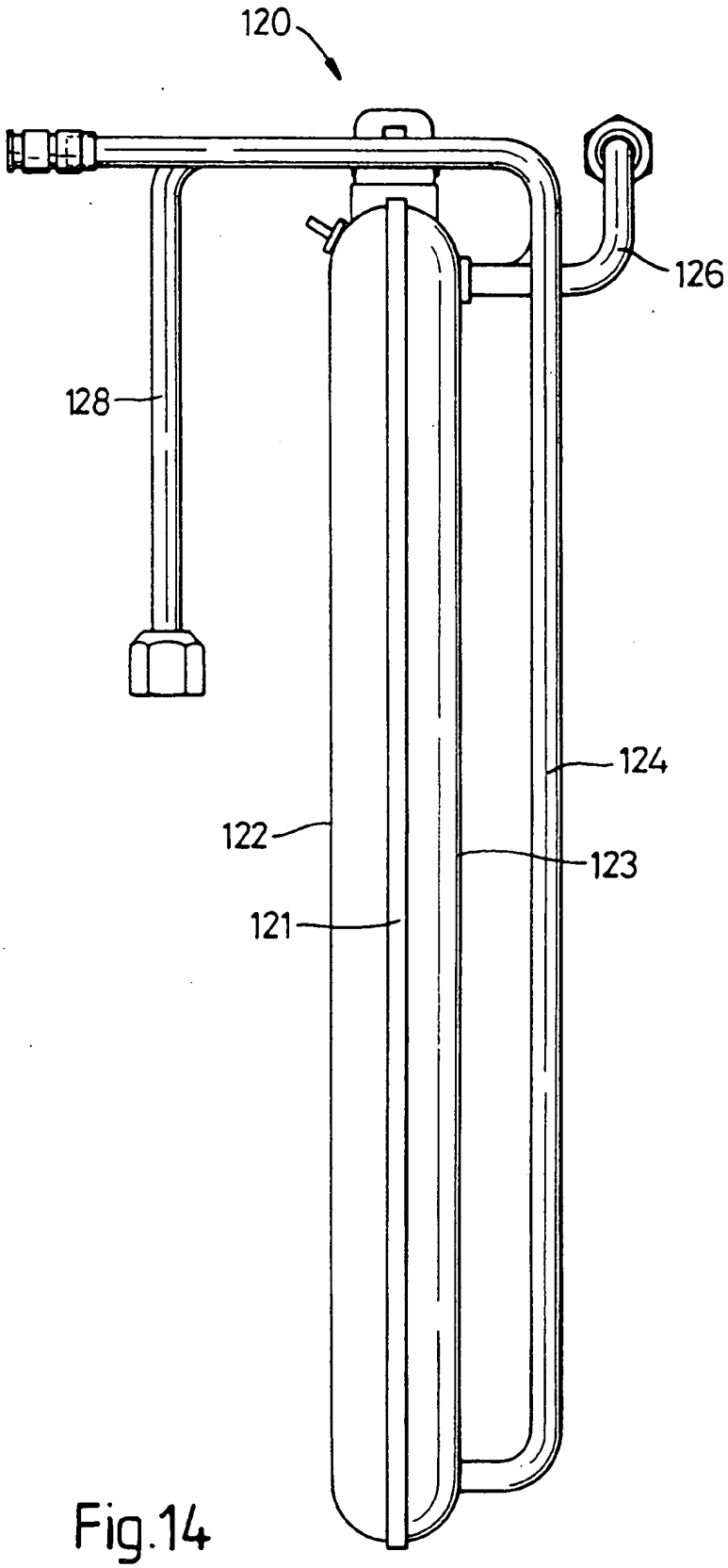

Fig.14